Limited impact of awareness-raising campaigns on hepatitis C testing practices among general practitioners

McLeod, A.; Cullen, B.L.; Hutchinson, S.J.; Roy, K.M.; Dillon, J.F.; Stewart, E.A.; Goldberg, D.J.

Published in:
Journal of Viral Hepatitis

DOI:
10.1111/jvh.12724

Publication date:
2017

Document Version
Author accepted manuscript

Full Title

Limited Impact of Awareness-Raising Campaigns on Hepatitis C Testing Practices among General Practitioners

Running Title

HCV Testing Practices among General Practitioners

Authors

McLeod A[1], Cullen BL[1], Hutchinson SJ[1,2], Roy KM[1], Dillon JF[3], Stewart EA[4], Goldberg DJ[1]

Affiliations

1. Health Protection Scotland, Glasgow, UK

2. School of Health and Life Sciences, Glasgow Caledonian University, Glasgow, UK

3. NHS Tayside and Medical Research Institute, University of Dundee, Dundee, UK

4. Department of Public Health, NHS Lothian and Bonnyrigg Health Centre, Bonnyrigg, Edinburgh, UK

Corresponding Author:

Allan McLeod

Address: Meridian Court, 5 Cadogan Square, Glasgow, G2 6QE, United Kingdom

Email: allan.mcleod@nhs.net

Telephone: 0141 300 1916

Fax: 0141 300 1172

Abstract

The global hepatitis strategy calls for increased effort to diagnose those infected, with a target of 90% diagnosed by 2030. Scotland's Action Plan on Hepatitis C included awareness-raising campaigns, undertaken during 2008-2011, to promote testing by General Practitioners (GPs). We examined HCV testing practice among GPs before and following these campaigns. Scottish GPs were surveyed, using Dillman's method, in 2007 and 2013; response rates were 69% and 60%, respectively. Most respondents offer testing when presented with a risk history (86% in 2007, 88% in 2013) but only one fifth actively sought out risk factors (19 in 2007, 21% in 2013). Testing was reportedly *always/almost always/usually* offered to people who inject drugs (PWID) (84% in 2007, 87% in 2013). Significant improvements in the offer of testing were reported in patients with abnormal LFTs (41% in 2007, 65% in 2013, $p<0.001$) and who had received medical/dental treatment in high prevalence countries (14% in 2007, 24% in 2013, $p=0.001$). In 2013, 25% of respondents had undertaken HCV-related Continued Professional Development (CPD). This group were significantly more likely to actively seek out risk factors ($p=0.009$) but only significantly more likely to offer a test to patients who had received medical/dental treatment in high prevalence countries ($p=0.001$). Our findings suggest that government-led awareness-raising campaigns have limited impact on GPs' testing practices. If the majority of the HCV infected population are to be diagnosed, practitioner-based or physician-centred interventions should be considered alongside educational initiatives targeted at professional.

Key Words

hepatitis C; general practice; survey; testing; awareness-raising

Introduction

With the development of highly effective Direct Acting Antiviral (DAA) treatment for Hepatitis C virus (HCV) infection, control of the disease is now possible [1]. However, to achieve this goal it will be necessary to find those individuals who are infected but remain undiagnosed. Across European countries, there is wide variation in the proportion of infected persons who have been diagnosed, from France where the majority (56% in 2005) have been diagnosed to Poland and other Central European countries where more than 80% are believed to remain undiagnosed [2,3].

When the Hepatitis C Action Plan for Scotland was launched in 2006, almost two-thirds of the estimated 38,000 chronic HCV infections in Scotland remained undiagnosed [4]. A key aim of the Action Plan was to identify these undiagnosed individuals. Primary care was considered an appropriate setting to focus awareness raising activities as previous studies have demonstrated increases in both testing and diagnoses as a result of targeted screening in the general practice setting [5-8].

On a national level, a number of awareness-raising activities undertaken during Phase II of the Action Plan (2008-2011) were aimed specifically at GPs [9]. These included a Chief Medical Officer's letter, an information website for professionals (www.hepatitisscotland.org.uk), adverts in the medical press and an information pack (including a leaflet, mouse mat and other items that prompted them to think of HCV and directing them to the website). The Royal College of General Practitioners introduced a "Certificate in the Detection, Diagnosis and Management of Hepatitis B and C in Primary Care" delivered through online and face-to-face Continued Professional Development (CPD) training in 2011[10].

Here we present results of two surveys of GPs in 2007 and 2013 to i) describe GPs' testing practices, ii) examine changes in practice following the Action Plan, and iii) determine physician-perceived barriers to HCV testing in primary care.

Materials and Methods

GP survey population

GP training practices, where newly qualified doctors and medical students gain experience of general practice, were identified as an appropriate sample to survey in 2007 as contact details were readily available and in the public domain [11]. The training lead for each practice was asked to complete the survey. The training lead for all but two of the GP training practices throughout Scotland (n=235) were included in the survey; this represented 23% of all general practices in Scotland at that time (233/1030). Of the two excluded from the survey, one GP was on long-term sick leave and one addressee was unknown. To ascertain the urban/rural distribution of each practice, the Scottish Government classification scheme (2005-2006) was employed [12]. The same GPs, regardless of whether they retained their training lead status, were surveyed in 2013. Seventeen GPs were not surveyed in 2013 as they had since moved practice (13), retired (3), or were on maternity leave (1).

Questionnaire

A questionnaire was designed to determine GPs' HCV testing practices using a combination of open and closed questions. This included questions on the characteristics of the GP's practice (NHS board and urban/rural category), whether the GP tests for HCV, how many HCV tests are undertaken per month, how many HCV patients diagnosed in the last year and the number of HCV patients currently under the GP's care. How frequently the offer on an HCV test would be made to key risk groups (as specified in the Scottish Intercollegiate Guidelines Network (SIGN) guidance) [13] was asked. Responses for this question used the scale "Always/almost always", "Usually", "About half the time", "Sometimes", or "Never/rarely". GP perceived barriers (i) associated with the client and (ii) associated with

the practice were also asked and responses for this question used the scale “Strongly agree”, “Agree”, “Disagree”, “Strongly disagree”.

Piloting of this questionnaire was undertaken with GPs associated with i) the Greater Glasgow and Clyde NHS Board Managed Care Network, and ii) the evaluation of a GP-based HCV screening interventions in Glasgow [7,8]. The 2013 questionnaire included all of the questions from the 2007 questionnaire with the addition of questions to i) explore access to the Action Plan awareness-raising initiatives implemented following the initial survey, and ii) whether the respondents considered future delivery of treatment through Primary Care may improve treatment uptake.

Implementation of survey

The survey was implemented, during April/May 2007 and October/November 2013, using Dillman’s Tailored Design Method [14]. This consisted of five key elements which have been shown to improve the response to postal surveys: i) a respondent-friendly questionnaire, ii) five contacts with the questionnaire recipient during the survey period, iii) inclusion of a stamped addressed envelope, iv) personalised correspondence, and v) a £15 book token as an incentive for completion of the questionnaire. The voluntary and confidential nature of the survey was emphasised. A copy of the survey was mailed to the GP(s) responsible for training in every practice.

Data analysis

Data were managed and analysed using the Statistical Package for Social Sciences (SPSS) Version 21.0 [15].

Frequencies for each survey question were analysed. For analysis of frequency key population groups are offered an HCV test answers were combined from five categories to

three: “Always/Almost always/Usually”, “About half the time/Sometimes”, and “Never/Rarely”. For analysis of barriers to HCV testing, answers were combined from four categories to two: “Strongly agree/Agree” and “Disagree/Strongly disagree”. Where appropriate, the significance of any differences between the 2007 and 2013 were analysed using Kruskal Wallis test or Fishers Exact test.

For 2013 responses, HCV training level was stratified into three categories: “CPD” (those who have undertaken a formal CPD course, for example courses provided by NHS Education Scotland or the Royal College of General Practitioners), “Awareness raising” (those who reported receiving at least one of Chief Medical Officer's letter, Hepatitis C GP information pack, or online training resources and did not report CPD), and “None”. Comparisons of training level by likelihood of offering an HCV test to key population groups and circumstances under which an HCV test were undertaken using Kruskal Wallis. Where the significance of this was less than p=0.05, a post hoc pairwise analysis was used to compare the significance among the training levels. A large proportion of the “None” group reported self-directed reading to ensure their HCV knowledge is current and so a sensitivity analysis comparing this group with the CPD group was undertaken.

Results

Characteristics of surveyed GP training practices (Appendix)

The practices of surveyed GPs accounted for 23% (233/1030) of all practices in Scotland in 2007 and 22% (217/991) of all practices in Scotland in 2013. Surveyed practices were more concentrated in urban areas (65% of all practices in urban areas in 2007 and 2013 versus 67% of surveyed practices in 2007 and 71% in 2013). Respondents were less concentrated in urban areas 59% in 2007 and 51% in 2013. At least 60% of the 233 surveyed GPs responded to each survey (69% in 2007 and 60% in 2013).

HCV Testing and Diagnosis (Tables 1 and 2)

Most respondents reported testing for HCV (91% in 2007 and 90% in 2013), almost all of whom reported testing fewer than 10 patients in an average month (98% in both surveys). HCV caseload had increased over time with 30% of respondents in 2007 reporting having more than five HCV patients, compared with 45% of respondents in 2013 (p=0.024).

Among those testing for HCV, more than 85% reported they would "opportunistically offer a test when the client presents with a risk history" (86% in 2007, 88% in 2013); almost three quarters reported they would "opportunistically offering a test when the client presents with a medical indication of liver disease" (74% in 2007, 72% in 2013), around half reported testing "when requested" (52% in 2007, 48% in 2013), less than a quarter "actively seek out risk factors" (19% in 2007, 21% in 2013), and the lowest proportion reported testing "as part of a routine screen" (15% in both surveys). There were no statistically significant differences across the surveys.

Key populations to test for HCV (Table 3)

Variation of approach among GPs regarding the key populations to test for HCV was apparent. Respondents reported that they would "Always"/ "Almost always"/ "Usually" offer an HCV test to patients with abnormal Liver Function Tests (LFTs) (41% in 2007, 65% in 2013, p<0.001), current People Who Inject Drugs (PWID) (84% in 2007, 87% in 2013, p0.383), Previous PWID (82% in 2007, 81% in 2013, p=0.754), HIV positive patients (84% in 2007, 88% in 2013, p=0.378), blood product recipients (22% in 2007, 26% in 2013, p=0.154), blood transfusion recipients (14% in 2007, 24% in 2013, p=0.135), individuals who received medical/dental treatment in high HCV prevalence countries (14% in 2017, 26% in 2013, p=0.001), and those with sexual or household contact with an HCV infected person (71% in 2007, 80% in 2013, p=0.157)

Barriers to testing (Table 4)

The surveys explored barriers to testing associated with the client as well as those associated with the practice as perceived by the responding GPs. Among' barriers to testing related to the client, GPs most frequently "strongly agree/agreed" the client not identifying him/herself as being at risk (87% in 2007, 80% in 2013), poor awareness of HCV among clients (83% in 2007, 80% in 2013) and HCV not being a priority for the client (68% in 2007,64% of GPs in 2013). Across both surveys, the majority of respondents "disagreed" or "strongly disagreed" (85% in 2007, 91% in 2013) that poor acceptability of testing services was a barrier to testing associated with clients. There were no significant changes across the surveys for barriers associated with the client.

GPs' perceptions of barriers to testing associated with the practice were more variable across the surveys. Respondents "strongly agreed/agreed" that the following were barriers associated with the practice but the proportion decreased across the surveys: limited

knowledge of testing protocols and who to test (73% in 2007, 50% in 2013, p<0.001), poor awareness among staff (66% in 2017, 51% in 2013, p=0.011), lack of time for pre and post test counselling (61% in 2007, 47% in 2013, p=0.019), insufficient staff with appropriate skill for counselling (56% in 2017, 31% in 2013, p<0.001), limited knowledge of who, and where to refer diagnosed patients (32% in 2007, 15% in 2013, p=0.001), waiting time for clinical appointment following initial specialist referral (24% in 2007, 10% in 2013, p=0.003). The majority of respondents strongly agree/agree that inappropriate environment for testing was a barriers to testing and there was no significant difference across surveys (89% in 2007, 92% in 2013, p=0.384). Conversely, a minority strongly agree/agree that "HCV is not an item of payment" was a barrier to testing and there was no difference across surveys (25% in 2007, 21% in 2013, p=0.402).

Contact with Hepatitis C awareness-raising and training initiatives

In 2013, more than half of respondents (57%) had heard of the Scottish Hepatitis C Action Plan. Of 2013 respondents 25% reported having undertaken a formal CPD course, 59% reported being exposed to "Awareness raising" (having receiving at least one of Chief Medical Officer's letter, Hepatitis C GP information pack, or online training resources and did not report CPD), and 16% had received no HCV training or awareness-raising.

Differences in testing practice by contact with awareness-raising initiatives (Tables 5 and 6)

Training level was found to be significantly associated with the proportion of respondents who reported "Always"/"Almost always"/"Usually" only for individuals who received medical/dental treatment in high HCV prevalence countries (39% for CPD, 15% for Awareness raising, 10% for none, p=0.002). In the pairwise analysis, the CPD group compared with the None group (p=0.001) and the Awareness raising group compared with

the None group (p=0.024) were significantly different. CPD compared with Awareness raising was not significantly different (p=0.265).

With regard to circumstances where an HCV test would be offered, the only significant difference by training group for actively seeking out risk factors. Among those reporting CPD, 31% actively sought risk factors for testing, 18% for the Awareness raising group, and none of the group who had received no CPD or awareness raising (p=0.012). In the pairwise analysis, only CPD compared with the None group was significant (p=0.009).

For those who reported not attending or undertaking training/CPD events for Hepatitis C, almost three quarters (73%) ensured their knowledge of hepatitis C was current through self-directed reading. A sensitivity analysis comparing this group with the CPD group found that the CPD group were significantly more likely to "Always"/"Almost always"/"Usually" offer at test to Current PWID (97% CPD, 75% self-directed reading, p=0.023) and those receiving medical/dental treatment in high prevalence countries (40% CPD, 13% self-directed reading, p=0.003). Similarly, the CPD group was more likely to actively seek out risk factors (32% CPD, 0% self-directed reading, p=0.005).

Delivery of Hepatitis C treatment in Primary Care

Eighty-one percent (109/135) of respondents in 2013 agreed that delivery of new oral treatments for hepatitis C, which are more effective, shorter in duration and much better tolerated, in primary care could improve treatment uptake. Of the 19% who did not agree, concerns about resources, requirement of specialist support and the importance of training were indicated.

Discussion

Summary of findings

Despite the first publication of the Scottish Intercollegiate Guidelines Network (SIGN) guidelines [14] on HCV in 2006, we found variation in GPs' testing practice across the key populations when surveyed the following year. While the proportion of respondents reporting that they would offer a test to current/former PWID and HIV positive patients was high, the less common risk groups such as historical blood and blood products recipients or those who had received medical or dental treatment in high prevalence countries was considerably lower. Most respondents reported offering a test when presented with a risk or medical prompt but less than a quarter actively seek out risk factors for HCV.

Across the two surveys, despite numerous awareness-raising activities at both a national and local level during Phase II of the Hepatitis C Action Plan (2008-2011) [9], improvements in testing practice were limited. The only significant increases in HCV testing awareness were for patients with abnormal liver function tests (LFTs) and for patients who had received medical or dental treatment in high HCV prevalence countries. While physician-perceived barriers to testing related to the client remained largely the same across both surveys, respondents consistently reported fewer perceived barriers related to the practice in 2013 than in 2007.

The majority of respondents recalled being exposed to some form of HCV awareness-raising, but only a minority had undertaken formal, HCV-related CPD. Among those who had undertaken CPD, actively seeking out risk factors and offering an HCV test to patients who had received medical/dental treatment in high prevalence countries were the only significant differences in practice than those who had not.

While this demonstrates some effectiveness of CPD, these improvements were modest and less than a third of the CPD group reported actively seeking risk factors. This is the optimal approach to case-finding, particularly among those whose risk may not be immediately apparent, such as former PWID, or those who remain asymptomatic. None of the respondents who had received neither CPD nor awareness-raising reported actively seeking out risk factors and only 75% of this group would offer an HCV test to a current PWID.

Validity of Observations

This is the first study to examine GPs' practices related to HCV in the context of a major government policy and investment. This paper presents the views and practice prior to, and following, the Action Plan awareness-raising initiatives. A key limitation of this study is the inability to undertake a paired analysis across GPs responding twice. As the 2007 survey was undertaken as part of a needs assessment project, it was not envisioned at that time that the survey would later be repeated. However, the 2007 survey provided the best available baseline data for knowledge and practice prior to the implementation of the awareness-raising campaigns.

The use of GP training leads may not be representative of the GP population in Scotland. The practices of the surveyed GPs were representative of all Scottish practices in terms of their NHS board affiliation and urban/rural distribution. However, given the likelihood that GP training practice staff will be kept informed of current guidelines for teaching purposes, although this will be the case for a wide variety of conditions rather than specialising in HCV, these results may indicate a high water mark of knowledge. A 2011 UK-wide survey of medical trainers (including GPs) found that GPs were responsible for a median of two trainees. Half reported having no additional contracted hours for such supervision but typically spend three hours a week on training [16]. This may limit the additional effort

made on maintaining specific HCV skills. There will also be GPs with high HCV caseload, working in a high prevalence area, or with a particular interest in HCV who may not have been surveyed but who have better HCV testing practice.

Comparison with Existing Literature

Some previous studies reported poor knowledge of HCV among GPs, such as not incorrect interpretation of test results or the belief that blood transfusion continued to be a risk even after the introduction of screening. Generally, the proportion of GPs reporting that PWID should be offered an HCV test is in excess of 80% but this is reduced for the less common risk groups such as blood product recipients or sexual contacts, as is consistent with our results. Several of these studies also indicate that the offer of a test is sub-optimally made as the GPs rarely actively seek risk factors [17-21]. None of these studies were in the context of a major policy such as the Scottish Hepatitis C Action Plan.

Our findings, particularly the high proportion of respondent agreeing that lack of time for pre and post test counselling is a barrier to testing and the low proportion of respondents actively seeking out risk factors, are consistent with a case-finding study in England, in which GPs reported confidence in their knowledge of HCV but cited short consultation times and remembering to offer a test as the main barriers to testing [22]. That study suggested electronic reminders within the patient management system may increase the offer of an HCV test. A 2015 meta-analysis found that practitioner-based interventions that included in-practice support had the most impact on increasing test uptake (increasing by 3.5times compared with no intervention) while media or information based campaigns had less impact (increase test uptake by 1.5 times compared with no intervention) [23]. This is consistent with our findings that GPs who had undertaken CPD were more likely to actively seek out risk factors than those who had received no CPD or awareness-raising.

Significance of research

During the interval between the two surveys, the proportion of Scotland's HCV infected population who were diagnosed was estimated to have increased from 38% to 55% [24, 25]; one of the key drivers of the increase was the introduction of Dried Blood Spot testing in community drug services for people who, generally, are still injecting drugs [26,27]. It is estimated, however, that the majority of the 45% of HCV infected people who remained undiagnosed as at 2013, were people who were no longer injecting. Thus, despite over 88% of GP's stating that they always offer an HCV test to someone they knew to have injected drugs in the past, thousands of former PWID in Scotland remain undiagnosed.

It is likely that many of these will have been to their GP at least once during the six year interval between surveys but identification would require actively seeking out their past injecting risk. Where the patient's injecting history was short or further in the past, it will be less likely that the risk is presented in an opportunistic manner.

Improved case-finding among non-PWID groups is of particular importance in Scotland following the publication of the Penrose Inquiry Final Report, which recommended that "the Scottish Government takes all reasonable steps to offer an HCV test to everyone in Scotland who had a blood transfusion before September 1991 and who has not been tested for HCV" [28]. Our findings suggest the status quo would be insufficient to attain this goal and further targeted awareness-raising among the patient group may also be required.

A growing body of evidence has demonstrated that significant increases in HCV screening can be achieved through electronic clinical reminders in patient management systems [22, 29,30]. Such interventions are relatively easy to implement as they require one-off changes to the patient management system and can be rolled out across multiple users and practices. Similar increases in HCV testing have been observed following the introduction of a physical

reminder attached to patient notes [31]. A qualitative analysis of HCV testing and diagnoses delay (where a diagnoses was more than 15 years after suspected transmission) found that, patients may not believe themselves to be at risk and are less likely to volunteer risk information but prompts to discuss risks may increase testing [32].

Based on results from our study, an electronic reminder that encouraged a GP to ask about the patient's risk factors for HCV would remove the need for the GP to actively seek these out. Such an approach could be used to overcome the reported physician-perceived barriers of "poor awareness among staff" and "limited knowledge of testing protocols and who to be tested". This approach would have an impact on consultation times but for those individuals with a past risk, for example former PWID or historic blood transfusion recipients, it is likely that a one-off screening would be required. The SIGN guidelines for HCV recommend annual testing only for those who remain at risk of infection [13].

Half of survey respondents agreed that lack of time for pre and post test counselling is a barrier to HCV testing. A 2001 WHO consultation on increasing HIV testing noted that in some settings informed consent was an acceptable replacement for pre-test counselling while post-test counselling remained essential following a positive results [33,34]. An extension of this would be to adopt an opt-out model, where patients receiving any routine blood test would also be tested for a blood-borne virus, which removes the requirement for a discussion on risk factors. This has been demonstrated to have a positive impact on HCV testing in hospital settings [35, 36]. A recent study in Ireland on opt-out testing for all patients having routine blood tests in general practice described low levels of opt-out (10.5%) but the yield for case-finding was low with only 2 new HCV and hepatitis B diagnoses made among more than 1000 patients over a 6 month period [37].

Improvements in primary care screening have been observed through the use of financial incentives such as Quality and Outcomes Framework (QOF) payments, where GPs in Scotland received additional payments for undertaking clinical and public health activities such as ensuring patients aged over 45 or over had a record of blood pressure or the proportion of women aged between 20 and 60 who have a record of a cervical screen in the preceding 5 years. These improvements may continue after incentives are withdrawn [38, 39]. While a minority of respondents (25% in 2007 and 21% in 2013) agreed that HCV not being an item of payment was a barrier to testing, such incentives may promote increases in testing nonetheless. Further study into the feasibility of these models in Scotland is recommended. The majority of respondents agreed that, if properly resourced, a move to the delivery of new HCV treatments to primary care may improve uptake of treatment. A clinical trial in the UK found that integrating HCV treatment in primary care with other services for the PWID population also resulted in increases of HCV testing and diagnoses [40]. This study included a clinical nurse specialist and consistent with previously discussed findings that practice-based support interventions result in the largest increases in HCV testing and diagnoses [7, 8, 23].

The World Health Organisation (WHO) has set a target for diagnosing 30% of HCV infections by 2020 and 90% by 2030 [41]. The proportion of diagnosed infections varies by country, with some countries, such as Australia, in excess of 80% and others, such as India, where it may be as low as 5% [42, 43]. Our results, based on the experience of the Scottish Action Plan, may be used to inform other countries seeking to meet the WHO targets. While directing funding to awareness-raising activities for GPs may result in some modest increases in testing and diagnoses in other countries, other more physician-centred measures should also be considered.

As we enter the era of Direct Acting Antiviral therapy, which offers both the possibility of control of Hepatitis C and a move of treatment from secondary to primary care, the importance of general practitioners' HCV testing practice has never been more critical. The impact of government-led awareness-raising campaigns was limited and it is clear that to identify the undiagnosed population, particularly those with a distant history o injecting drugs that is less likely to be apparent or the less common risk groups such as historic blood transfusion recipients, GPs require additional support and direction to expand HCV testing. Further measures, such as additional payments to GPs, electronic reminders or adoption of opt-out testing, should be considered alongside educational initiatives targeted at professionals and operate in tandem with awareness-raising among at risk, or formerly at risk, groups.

Acknowledgements and disclosures

The authors are grateful to Dr JJK Roberts for his valuable contribution to the design of the questionnaire and to Elaine Daly and Caroline Kelleher at Health Protection Scotland for their support in the implementation of the survey. The authors would also like to thank all the general practitioners who took the time to participate in the survey.

Statement of Interests

SH reports grants from Scottish Government, during the conduct of the study; personal fees from Abbvie, Gilead, Janssen, MSD, Roche, grants from Janssen, outside the submitted work. ES has served as a speaker for GSK, Pfizer, and Janssen and as an advisory board member for Gilead. JD reports grants and personal fees from Roche, grants and personal fees from MSD, grants and personal fees from Janssen, grants and personal fees from Gilead, personal fees from BMS, grants from GSK, grants and personal fees from Abbvie, outside the submitted work. DG reports personal fees from MSD, Janssen, Abbvie, BMS & Gilead, outside the submitted work.

This work was supported through funding from the Scottish Government. The Scottish Government had no influence or involvement in any aspect of this study.

References

1. Dore G., Matthews GV, Rockstroh J. Future of hepatitis C therapy: development of direct-acting antivirals. *Curr Opin HIV AIDS* 2011; 6: 508–13.

2. Merkinaite S, Lazarus JV, Gore C. Addressing HCV infection in Europe: reported, estimated and undiagnosed cases. *Cent Eur J Public Health.* 2008 Sep;16(3):106-10.3. Dultz G, Zeuzem S. Hepatitis C Virus: A European Perspective. *Gastroenterol Clin North Am.* 2015 Dec;44(4):807-24. doi: 10.1016/j.gtc.2015.07.008. Epub 2015 Oct 1. Review.

3. Cornberg M, Razavi HA, Alberti A, *et al.* A systematic review of hepatitis C virus epidemiology in Europe, Canada and Israel. *Liver Int.* 2011 Jul;31 Suppl 2:30-60. doi: 10.1111/j.1478-3231.2011.02539.x. Review.

4. Hutchinson SJ, Roy KM, Wadd S, *et al.* Hepatitis C virus infection in Scotland: epidemiological review and public health challenges *Scott Med J.* 2006 May;51(2):8-15. Review.

5. Scottish Government. Hepatitis C Action Plan for Scotland: Phase I (September 2006-April 2008). Edinburgh: Scottish Government, 2006. http://www.scotland.gov.uk/publications/2006/09/15093626/0

6. Cullen W, Stanley J, Langton D, Kelly Y, Staines A, Bury G. Hepatitis C infection among injecting drug users in general practice: a cluster randomised controlled trial of clinical guidelines' implementation. *Br J Gen Pract*. 2006 Nov;56(532):848-56.

7. Anderson EM, Mandeville RP, Hutchinson SJ, *et al.* Evaluation of a general practice based hepatitis C virus screening intervention. *Scott Med J.* 2009 Aug;5(3):3-7

8. Cullen BL, Hutchinson SJ, Cameron SO, *et al.* Identifying former injecting drug users infected with hepatitis C: an evaluation of a general practice-based case-finding intervention. *J Public Health (Oxf).* 2012 Mar;34(1):14-23. doi: 10.1093/pubmed/fdr097.

9. Scottish Government. Hepatitis C Action Plan for Scotland: Phase II (May 2008-March 2011). Edinburgh: Scottish Government, 2008. http://www.scotland.gov.uk/publications/2008/05/13103055/0

10. Royal College of General Practitioners. RCGP Certificate in the Detection, Diagnosis and Management of Hepatitis B and C in Primary Care. Available at: http://www.rcgp.org.uk/learning/substance-misuse-and-associated-health-landing-page/rcgp-certificate-in-the-detection-hepatitis-b-and-c.aspx

11. NHS Education for Scotland. GP Specialist Training Practices 2006. Available at: http://www.nes.scot.nhs.uk/medicine/gpvt

12. Information Services Division, NHS National Services Scotland. GP Workforce Statistics 2007. Patients registered with practices, by NHS Board and age group; as at 1 October 2007. Available at: http://www.isdscotland.org/isd/4614.html

13. Scottish Intercollegiate Guidelines Network (SIGN).Management of hepatitis C. Edinburgh: SIGN; 2013. (SIGN publication no. 133). July 2013. Available from URL: http://www.sign.ac.uk

14. Dillman DA. Mail and internet surveys. The tailored design method. 2nd Edition. New Jersey: Wiley & Sons, 2007.

15. IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

16. General Medical Council. (2011). National trainer survey 2011:key findings. London, GMC. Available from: http://www.gmc-uk.org/National_Trainer_survey_2011_v5.pdf_48076220.pdf

17. D'Souza RFC, Glynn MJ, Alstead E, Osanayo C, Foster GR. Knowledge of chronic Hepatitis C among East London primary care physicians following the department of health's educational campaign. Q J Med 2004; 97:331-336.

18. Massari V1, Retel O, Flahault A. How do general practitioners approach hepatitis C virus screening in France? Eur J Epidemiol. 1999 Feb;15(2):119-24.

19. Shehab TM, Sonnad SS, Jeffries M, Gunaratnum N, Lok AS. Current practice patterns of primary care physicians in the management of patients with hepatitis C. Hepatology. 1999 Sep; 30 (3): 794-800.

20. Peksen Y, Canbaz S, Leblebicioglu H, Sunbul M, Esen S, Sunter AT. Primary care physicians' approach to diagnosis and treatment of hepatitis B and hepatitis C patients. *BMC Gastroenterol.* 2004 Feb 6;4:3.

21. Wang YH, Guy R, Hellard M. The Victorian hepatitis C education program for GPs--an evaluation. *Aust Fam Physician.* 2009 Sep; 38 (9): 749-52.

22. Datta S, Horwood J, Hickman M, Sharp D. Case-finding for hepatitis C in primary care: a mixed-methods service evaluation. *Br J Gen Pract.* 2014 Feb; 64 (619): e67-74. doi: 10.3399/bjgp14X677112

23. Aspinall EJ, Doyle JS, Corson S, *et al*. Targeted hepatitis C antibody testing interventions: a systematic review and meta-analysis. *Eur J Epidemiol.* 2015 Feb;30(2):115-29. doi: 10.1007/s10654-014-9958-4. Epub 2014 Nov 11.

24. McLeod A, Hutchison S, Goldberg D. Surveillance of known hepatitis C antibody positive cases in Scotland: results to 31 December 2013. Health Protection Scotland. 2013;48(18)

25. McLeod A, Weir A, Aitken C, *et al*. Rise in testing and diagnosis associated with Scotland's Action Plan on Hepatitis C and the introduction of dried blood spot testing. *J Epidemiol Community Health.* 2014 Dec; 68 (12): 1182-8. doi: 10.1136/jech-2014-204451. Epub 2014 Aug 28.

26. Judd A, Parry J, Hickman M, McDonald T, *et al*. Evaluation of a modified commercial assay in detecting antibody to hepatitis C virus in oral fluids and dried blood spots. *J Med Virol.* 2003 Sep;71 (1):49-55.

27. McAllister G, Innes H, McLeod A, *et al*. Uptake of hepatitis C specialist services and treatment following diagnosis by dried blood spot in Scotland. *J Clin Virol.* 2014 Nov; 61(3): 359-64. doi: 10.1016/j.jcv.2014.09.004. Epub 2014 Sep 16.

28. Penrose L. The Penrose Inquiry: Final Report. Edinburgh: APS Group Scotland, 2015

29. Shahnazarian V, Karu E, Mehta P. Hepatitis C: improving the quality of screening in a community hospital by implementing an electronic medical record intervention. *BMJ Qual Improv Rep*. 2015 May 20;4(1). pii: u208549.w3409. doi: 10.1136/bmjquality.u208549.w3409. eCollection 2015.

30. Sidlow R, Msaouel P. Improving Hepatitis C Virus Screening Rates in Primary Care: A Targeted Intervention Using the Electronic Health Record. *J Healthc Qual.* 2015 Sep-Oct;37(5):319-23. doi: 10.1097/JHQ.0000000000000010.

31. Litwin AH, Smith BD, Drainoni ML, *et al.* Primary care-based interventions are associated with increases in hepatitis C virus testing for patients at risk. *Dig Liver Dis.* 2012 Jun; 44 (6) :497-503. doi: 10.1016/j.dld.2011.12.014. Epub 2012 Feb 18.

32. Harris M, Ward E, Gore C. Finding the undiagnosed: a qualitative exploration of hepatitis C diagnosis delay in the United Kingdom. *J Viral Hepat*. 2016 Feb 29. doi: 10.1111/jvh.12513. [Epub ahead of print]

33. World Health Organisation (WHO). Increasing Access to Knowledge of HIV status: Conclusions of a WHO Consultation. 2001 Dec 3-4. Available from: http://apps.who.int/iris/bitstream/10665/67362/1/WHO_HIV_2002.09.pdf

34. Hamill M, Burgoine K, Farrell F, *et al.* Time to move towards opt-out testing for HIV in the UK. *BMJ*. 2007 Jun 30;334(7608):1352-4. Review. O'Connell S, Lillis D, Cotter A, O'Dea S, Tuite H, Fleming C, Crowley B,

35. Fitzgerald I, Dalby L, Barry H, Shields D, Norris S, Plunkett PK, Bergin C. Opt-Out Panel Testing for HIV, Hepatitis B and Hepatitis C in an Urban Emergency Department: A Pilot Study. *PLoS One.* 2016 Mar 11;11(3):e0150546. doi: 10.1371/journal.pone.0150546.

36. Orkin C, Flanagan S, Wallis E, *et al.* Incorporating HIV/hepatitis B virus/hepatitis C virus combined testing into routine blood tests in nine UK Emergency Departments: the "Going Viral" campaign. *HIV Med*. 2016 Mar; 17 (3): 222-30. doi: 10.1111/hiv.12364.

37. O'Kelly M, Byrne D, Naughten E, Bergin C, Williams C. Opt-out testing for blood-borne viruses in primary care: a multicentre, prospective study. *Br J Gen Pract.* 2016 Jun;66(647):e392-6. doi: 10.3399/bjgp16X685225

38. Doran T, Kontopantelis E, Valderas JM, *et al.* Effect of financial incentives on incentivised and non-incentivised clinical activities: longitudinal analysis of data from the UK Quality and Outcomes Framework. *BMJ.* 2011 Jun 28;342:d3590. doi: 10.1136/bmj.d3590.

39. Kontopantelis E, Springate D, Reeves D, Ashcroft DM, Valderas JM, Doran T. Withdrawing performance indicators: retrospective analysis of general practice performance under UK Quality and Outcomes Framework. *BMJ.* 2014 Jan 27;348:g330. doi: 10.1136/bmj.g330.

40. Jack K, Willott S, Manners J, Varnam MA, Thomson BJ. Clinical trial: a primary-care-based model for the delivery of anti-viral treatment to injecting drug users infected with hepatitis C. Aliment Pharmacol Ther. 2009 Jan;29(1):38-45. doi: 10.1111/j.1365-2036.2008.03872.x. Epub 2008 Oct 13.

41. World Health Organisation (WHO). Combating hepatitis B and C to reach elimination by 2030. Advocacy Brief. 2016 May. Available from: http://www.who.int/hepatitis/publications/hep-elimination-by-2030-brief/en/

42. Bruggmann P, Berg T, Øvrehus AL, *et al.* Historical epidemiology of hepatitis C virus (HCV) in selected countries. *J Viral Hepat.* 2014 May;21 Suppl 1:5-33. doi: 10.1111/jvh.12247.

43. Wedemeyer H, Dore GJ, Ward JW. Estimates on HCV disease burden worldwide - filling the gaps. *J Viral Hepat*. 2015 Jan;22 Suppl 1:1-5. doi: 10.1111/jvh.12371.

Appendix: Characteristics of all GP practices in Scotland, surveyed practices, and responding practices by year

Characteristics		General practices		Practices surveyed		Practices responding to survey	
		2007 N (% of Total)	2013 N (% of Total)	2007 N (% of All Practices)	2013 N (% of All Practices)	2007 N (% of Surveyed)	2013 N (% of Surveyed)
NHS Board	Greater Glasgow & Clyde	274 (27%)	263 (27%)	53 (19%)	49 (19%)	37 (70%)	27 (51%)
	Lothian	127 (12%)	125 (13%)	29 (23%)	28 (22%)	22 (76%)	27 (93%)
	Tayside	71 (7%)	68 (7%)	26 (37%)	22 (32%)	17 (65%)	12 (46%)
	Grampian	84 (8%)	80 (8%)	25 (30%)	24 (30%)	15 (60%)	12 (48%)
	Other	474 (46%)	455 (46%)	100 (21%)	94 (21%)	69 (69%)	62 (62%)
	Total	**1030**	**991**	**233 (23%)**	**217 (22%)**	**160 (69%)**	**140 (60%)**
Urban/rural classification	Urban	667 (65%)	648 (65%)	157 (24%)	154 (24%)	93 (59%)	81 (51%)
	Rural	362 (35%)	343 (35%)	75 (21%)	63 (18%)	66 (88%)	59 (79%)
	Unknown	1 (0%)	0 (0%)	1 (100%)	0 (0%)	1 (100%)	0 (0%)
	Total	**1030**	**991**	**233 (23%)**	**217 (22%)**	**160 (69%)**	**140 (60%)**

*Other refers to NHS Ayrshire & Arran, Borders, Dumfries & Galloway, Forth Valley, Fife, Highland, Lanarkshire, Orkney, Shetland and Western Isles

Table 1: HCV related activities of GP respondents by survey

Characteristic		2007 N (%)	2013 N (%)	Kruskal Wallis test P-value
No of patients with HCV under care	None	13 (8%)	9 (6%)	**0.024**
	1-5	94 (59%)	64 (46%)	
	6-10	18 (11%)	29 (21%)	
	11-20	21 (13%)	19 (14%)	
	>20	10 (6%)	14 (10%)	
	Not Known	4 (3%)	5 (4%)	
Test for HCV	Yes	145 (91%)	125 (90%)	0.7
	No	15 (9%)	15 (10%)	
Number tested in an average month	<10	142 (98%)	125 (98%)	0.757
	11+	2 (1%)	2 (2%)	
	Not Known	1 (1%)	0 (0%)	
Number diagnosed in last 12 months	0-5	139 (97%)	125 (98%)	**0.005**
	6+	5 (3%)	2 (2%)	

Table 2: Circumstance under which respondents would offer an HCV test, by survey

Response*		Yes N (%)	No N (%)	Fisher Exact test
Actively seek out risk factors	2007	28 (19%)	117 (81%)	0.762
	2013	26 (21%)	98 (79%)	
Opportunistically offer test when client presents history	2007	125 (86%)	20 (14%)	0.719
	2013	109 (88%)	15 (12%)	
Opportunistically offer when client presents medical indication of liver disease	2007	108 (74%)	37 (26%)	0.679
	2013	89 (72%)	35 (28%)	
Test when requested	2007	76 (52%)	69 (48%)	0.464
	2013	59 (48%)	65 (52%)	
Test as part of routine screen	2007	22 (15%)	123 (85%)	1
	2013	18 (15%)	106 (85%)	

*Multiple responses were acceptable

Table 3: Likelihood of respondents offering an HCV test to different patient populations on becoming aware of risk information

Population	Survey	Response			Kruskal Wallis test
		Always/ almost always/Usually	About half the time/Sometimes	Never/ rarely	
Patients with abnormal LFTs	2007	58 (41%)	63 (45%)	20 (14%)	**<0.001**
	2013	84 (65%)	43 (33%)	3 (2%)	
Current IDU	2007	117 (84%)	20 (14%)	3 (2%)	0.393
	2013	111 (87%)	13 (10%)	3 (2%)	
Previous IDU	2007	117 (82%)	24 (17%)	2 (1%)	0.754
	2013	104 (81%)	21 (16%)	4 (3%)	
HIV positive	2007	108 (84%)	12 (9%)	8 (6%)	0.378
	2013	112 (88%)	9 (7%)	6 (5%)	
Blood products (before 1987)	2007	31 (22%)	37 (27%)	71 (51%)	0.154
	2013	32 (26%)	41 (33%)	51 (41%)	
Blood Transfusion (before 1992)	2007	27 (19%)	35 (25%)	77 (55%)	0.135
	2013	29 (24%)	38 (31%)	56 (46%)	
Medical/Dental in high prevalance countries	2007	19 (14%)	38 (27%)	83 (59%)	**0.001**
	2013	33 (26%)	43 (34%)	51 (40%)	
Sexual/Household Contact with HCV infected	2007	100 (71%)	33 (24%)	7 (5%)	0.157
	2013	101 (80%)	19 (15%)	7 (6%)	

Table 4: Barriers to Hepatitis C testing Associated with (A) the Client and (B) the Practice

Barriers to Hepatitis C Testing	Survey	Response: Strongly Agree / Agree N (%)	Response: Disagree / Strongly Disagree N (%)	Total	Kruskal Wallis P value
(A) Associated with the client:					
HCV is not a priority or relevant to the client at the time	2007	106 (68%)	50 (32%)	**156**	0.532
	2013	89 (64%)	49 (36%)	**138**	
Clients do not identify as being, or at some point being, at risk for HCV	2007	135 (87%)	20 (13%)	**155**	0.109
	2013	109 (80%	27 (20%)	**136**	
Stigma	2007	76 (49%)	79 (51%)	**155**	0.283
	2013	59 (43%)	79 (57%)	**138**	
Poor acceptability of testing services	2007	23 (15%)	133 (85%)	**156**	0.165
	2013	13 (9%)	125 (91%)	**138**	
Poor awareness of HCV among clients	2007	131 (83%)	27 (17%)	**158**	0.583
	2013	111 (80%)	27 (20%)	**138**	
Poor venous access	2007	32 (21%)	123 (79%)	**155**	0.502
	2013	33 (24%)	105 (76%)	**138**	
Perceived problems of confidentiality	2007	24 (15%)	131 (85%)	**155**	0.661
	2013	19 (14%)	120 (86%)	**139**	
Fear of services	2007	38 (25%)	117 (75%)	**155**	0.257
	2013	42 (30%)	96 (70%)	**138**	
Fear of diagnosis	2007	103 (66%)	52 (34%)	**155**	0.414
	2013	86 (62%)	53 (38%)	**139**	
(B) Associated with the practice:					
Poor awareness among staff	2007	103 (66%)	54 (34%)	**157**	**0.011**
	2013	71 (51%)	68 (49%)	**139**	
Inappropriate environment for testing	2007	139 (89%)	17 (11%)	**156**	0.384
	2013	128 (92%)	11 (8%)	**139**	
Insufficient staff with appropriate skill for counselling	2007	88 (56%)	69 (44%)	**157**	**<0.001**
	2013	44 (31%)	96 (69%)	**140**	
Limited knowledge of testing protocols and who to be tested	2007	115 (73%)	43 (27%)	**158**	**<0.001**
	2013	70 (50%)	69 (50%)	**139**	
Limited knowledge of who, and where, to refer diagnosed patients	2007	50 (32%)	107 (68%)	**157**	**0.001**
	2013	21 (15%)	118 (85%)	**139**	
Lack of time for pre and post test counselling	2007	96 (61%)	61 (39%)	**157**	**0.019**
	2013	66 (47%)	73 (53%)	**139**	
HCV is not an item of payment	2007	39 (25%)	116 (75%)	**155**	0.402
	2013	29 (21%)	109 (79%)	**138**	
Waiting time for clinical appointment following initial specialist referral	2007	35 (24%)	113 (76%)	**148**	**0.003**
	2013	14 (10%)	124 (90%)	**138**	

Table 5: Likelihood of GPs offering an HCV test to different patient populations by access to training/awareness raising activities, responses to 2013 survey

Factor	Training Level	Always/ almost always/Usually N (%)	About half the time/Sometimes N (%)	Never/ rarely N (%)	Kruskal Wallis P Value	Pairwise Comparison	P Value
Patients with abnormal LFTs	CPD[1]	22 (67%)	11 (33%)	0 (0%)	0.678		
	Awareness raising[2]	51 (66%)	23 (30%)	3 (4%)			
	None	11 (55%)	9 (45%)	0 (0%)			
Current IDU	CPD	30 (94%)	2 (6%)	0 (0%)	0.134		
	Awareness raising	66 (88%)	7 (9%)	2 (3%)			
	None	15 (75%)	4 (20%)	1 (5%)			
Previous IDU	CPD	28 (85%)	5 (15%)	0 (0%)	0.437		
	Awareness raising	62 (82%)	10 (13%)	4 (5%)			
	None	14 (70%)	6 (30%)	0 (0%)			
HIV positive	CPD	30 (91%)	3 (9%)	0 (0%)	0.47		
	Awareness raising	66 (89%)	3 (4%)	5 (7%)			
	None	16 (80%)	3 (15%)	1 (5%)			
Blood products (before 1987)	CPD	10 (32%)	11 (35%)	10 (32%)	0.221		
	Awareness raising	19 (26%)	24 (33%)	30 (41%)			
	None	3 (15%)	6 (30%)	11 (55%)			
Blood Transfusion (before 1992)	CPD	10 (32%)	11 (35%)	10 (32%)	0.124		
	Awareness raising	16 (22%)	22 (31%)	34 (47%)			
	None	3 (15%)	5 (25%)	12 (60%)			
Medical/Dental in high prevalence countries	CPD	12 (39%)	12 (39%)	7 (23%)	**0.002**		
	Awareness raising	19 (25%)	28 (37%)	29 (38%)			
	None	2 (10%)	3 (15%)	15 (75%)			
						CPD vs Awareness raising	0.265
						CPD Vs None	**0.001**
						Awareness raising vs None	**0.024**
Sexual Contact	CPD	28 (90%)	2 (6%)	1 (3%)	0.159		
	Awareness raising	59 (78%)	14 (18%)	3 (4%)			
	None	14 (70%)	3 (15%)	3 (15%)			

[1] Formal CPD for example courses provided by NHS Education for Scotland or the Royal College of General Practitioners

[2] Respondants reported receiving at least one of Chief Medical Officer's letter, Hepatitis C GP information pack, or online training resources and did not report CPD

Table 6: Circumstances under which GPs would offer an HCV test by access to training/awareness raising activities, responses to 2013 survey

Factor	Training Level	Yes N (%)	No N (%)	Krusak Wallis P Value	Pairwise Comparison	P Value
Actively seek out risk factors	CPD[1]	11 (31%)	24 (69%)	**0.012**		
	Awareness raising[2]	15 (18%)	68 (82%)			
	None	0 (0%)	22 (100%)			
					CPD vs Awareness raising	0.268
					CPD Vs None	**0.009**
					Awareness raising vs None	0.160
Opportunistically offer test when client presents history	CPD	31 (89%)	4 (11%)	0.397		
	Awareness raising	65 (78%)	18 (22%)			
	None	17 (77%)	5 (23%)			
Opportunistically offer when client presents medical indication	CPD	26 (74%)	9 (26%)	0.08		
	Awareness raising	55 (66%)	28 (34%)			
	None	10 (45%)	12 (55%)			
Test when requested	CPD	19 (54%)	16 (46%)	0.348		
	Awareness raising	35 (42%)	48 (58%)			
	None	8 (36%)	14 (64%)			
Test as part of routine screen	CPD	4 (11%)	31 (89%)	0.665		
	Awareness raising	13 (16%	70 (84%)			
	None	2 (9%)	20 (91%)			

[1] Formal CPD for example courses provided by NHS Education for Scotland or the Royal College of General Practitioners
[2] Respondants reported receiving at least one of Chief Medical Officer's letter, Hepatitis C GP information pack, or online training resources and did not report CPD